

REMARKS

Applicants respectfully request reconsideration and withdrawal of the objections and rejections set forth in the Office Action.

Drawings

In order to overcome this objection, applicants submit replacement formal drawings Figures 9 and 10, which are now labeled “Prior Art.” The replacement formal drawings are submitted in a separate transmittal, filed concurrently with this response. In accordance with MPEP § 608.029(v), because this is a mere change in the reference characters, a sketch showing the correction of the drawings does not have to be filed.

Specification

Applicants have amended the abstract to eliminate the use of brackets.

Rejections Under 35 USC § 103

Applicants contend that the present claims overcome the outstanding rejections for obviousness. Applicants contend that the Examiner has not established a *prima facie* case of obviousness, which requires (1) a teaching or suggestion of all the elements of the claims in the cited references, (2) motivation to combine or modify references to arrive at the present invention, and (3) a reasonable expectation of success of the invention. No combination of the references support any one of these three requirements for a *prima facie* case of obviousness.

There is no teaching or suggestion of all the claimed elements in the cited references

With respect to claim 10, the sole independent claim, as admitted by the Examiner in the most recent office action, no reference teaches injecting ammonia “at a concentration so that the amount of ammonia remaining in the flue gas after the injection step will be not less than 30 ppm.”

Claim 11 recites that “the flue gas discharged into the environment has been denitrated by about 90%.” This recitation is not found in the cited references.

Claims 15 and 16 teach injecting ammonia “a concentration so that the concentration of ammonia remaining in the flue gas when introduced into the heat exchanger will be in excess of the SO₃ concentration by 13 ppm or more.” This recitation is not found in the cited references.

Claim 29 recites that the stack is about 90 meters high and claim 30 further states that the stack is supported by a framework having a width of about 25 meters. These features are not found in the cited references.

Applicants contend that none of the features of claims 11, 15, 16, 29 or 30 are taught or suggested by the cited references. Therefore, the Examiner cannot establish a *prima facie* case of obviousness because there is no teaching or suggestion of all the elements of the claims in the cited references.

There is no motivation to combine the references

“Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined *only* if there is some suggestion or incentive to do so.” *In re Fritch*, 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992), quoting *ACS Hosp. Systems, Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984).

The primary reference used by the Examiner in all of the rejections for obviousness is U.S. Patent No. 5,024,171. The Examiner has selectively picked portions of this reference to support the position that this reference would motivate one of skill in the art to use more ammonia in the process. The ‘171, patent rather than motivating one of skill in the art to only increase the content of ammonia, actually only motivates to select the amount of ammonia in a narrowly tailored range. That is, this reference also teaches the adverse effects of adding excess ammonia. Applicants contend that when this reference is read as a whole that it would actually teach away from the present invention and would not suggest using the claimed amount of ammonia.

The Examiner cites one sentence from the '171 patent to support the contention that the this reference would motivate one of skill in the art to add the claimed amount of ammonia. However, when the entire paragraph is read in its entirety, it is actually a teaching away from adding the claimed amount of ammonia.

It is important that the proper amount of ammonia be injected. If too much ammonia is injected, an excess of ammonia is present in the power plant emissions, which itself poses an environmental hazard. If too little ammonia is injected, the sulfur trioxide is reacted to ammonium bisulfate rather than ammonium sulfate, which can form a sticky liquid mass inside the ducts or on equipment, or sulfur trioxide is emitted to the atmosphere. Careful control of the ammonia injection mass flow rate is required to avoid any of these undesirable results.

Thus, by restricting the upper amount of ammonia in such a way, the disclosure of the '171 patent teaches away from the following language of claim 10 "injecting ammonia into the flue gas prior to introducing the gas into an absorption tower, wherein the amount of ammonia is injected in such a quantity that an excessive level of ammonia or an ammonium salt will remain in the flue gas when the flue gas is subsequently contacted with an absorbing fluid . . . wherein the amount of ammonia injected is at a concentration so that the amount of ammonia remaining in the flue gas after the injection step will be not less than 30 ppm."

That is, the '171 patent attempts to minimize the amount of remaining ammonia by controlling the amount of ammonia precisely in a suitable range. In contrast, the present invention does not require the ammonia to be within a precise range. As recited in independent claim 10, "an excessive level of ammonia or an ammonium salt will remain in the flue gas when the flue gas is subsequently contacted with an absorbing fluid", which is not a narrow range of ammonia as required by the '171 patent. In other words, in the present invention the amount of ammonia does not have to be precisely controlled within a certain range and can be beyond the rang of the '171 patent so long as the ammonia is in excess.

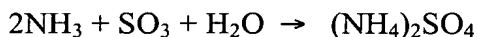
"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 31 USPQ 2d 1130, 1131 (Fed. Cir. 1994). Applicants urge that the upper limits on the amount of ammonia added in the '171 patent is a teaching away from the present invention,

and therefore this reference would not motivate one of ordinary skill in the art to arrive at the present invention.

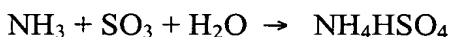
Furthermore, the entire system of the present invention is completely different from that of the '171 patent. The '171 patent does not teach the use of desulfurizers or denitrators. Thus, the '171 patent does suggest how to improve efficiency with respect to desulfurizers or denitrators.

Applicants contend that no other combination of any combination with of the cited references, *i.e.* the *Gas Purification Handbook*, DE G93 19 017.4 ("DE-017") or the *Chemical Engineers' Handbook* compensate for the deficiencies of the '171 patent.

With respect to claim 16 of the present invention, applicants wish to provide these additional comments. As described at page 41, lines 4-8 of the specification, that ammonia concentration in the flue gas in one of the working examples was determined to be 63 ppm so that it would be in excess of the equivalent amount required for the formation of ammonium sulfate as a result of the reaction of 13 ppm of sulfur trioxide. If the stoichiometric ratio of ammonia to sulfur trioxide is 2:1, neutral ammonium sulf is formed:



If the stoichiometric ration of ammonia to sulfur is 1:1, unfavorable acidic ammonium sulfate is formed:



This excess amount of 13 ppm corresponds to 2.5 times the value of the '171 patent.

There is no reasonable expectation of success

For the reasons given above, applicants contend that there is no reasonable expectation of success to arrive at the present invention. It follows that if there is no motivation to combine the '171 patent with any of the other cited references, one of skill in the art would not have had a reasonable expectation of success of the present invention.

Moreover as applicants have stated before, the inventors found that the amount of ammonia released can be considerably reduced by preventing ammonia initially absorbed in the absorbing slurry of the absorption tower from reversely being released into the flue gas further downstream. To achieve this on the downstream side of the region of the absorption tower in which the flue gas is brought into contact with the absorbing slurry, a region is provided in which a liquid having lower pH than the absorbing fluid is sprayed. Due to the higher acidity of this liquid, ammonia absorbed in the slurry is not so easily released into the gaseous phase. Rather, ammonia remaining in the flue gas is absorbed so that the treated gas leaves the flue gas treating system substantially free of ammonia. The dramatic effect of the invention was confirmed by means of model calculations which suggest that about 90% of the ammonia can be removed through this novel process. Thus, the new process is not only surprisingly simple but also highly effective, and not suggested by the prior art. The claimed process does not require the additional complexities of the various monitoring devices and algorithms that are essential to the '171 patent. Applicants contend that without the presence of the feedback control devices, the '171 patent in combination with any of the other cited references would not reasonably be expected to function.

Deficiencies of other cited references

Applicants further contend that none of the cited references, *i.e.* *Gas Purification*, the *Chemical Engineer's Handbook*, or DE G 93 19 017.4, remedy the deficiencies of the '171 patent. None of these references disclose the amount of ammonia injected, provide motivation to arrive at present invention with respect to the amount of ammonia injected or would provide a reasonable expectation that '171 patent could be practiced with its requisite complex feedback mechanisms.

With respect to the newly cited reference, *Gas Purification*, since the process of the present invention attains its result by performing all the steps in a systemic manner, this reference is irrelevant and would not suggest the present invention nor provide a reasonable expectation of success. This reference merely discusses the formation of ammonium sulfate at a higher pH.


Therefore, applicants maintain the rejections for obviousness are improper and respectfully request their withdrawal.

Conclusion

The present application is now in condition for allowance, and favorable reconsideration thereof is respectfully requested. If the Examiner believes that an interview would advance prosecution of the application, he is invited to contact the undersigned by telephone.

Respectfully submitted,

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